

CLIMATE CHANGE IN NIGERIA AND MITIGATING MEASURES

Akiojano, A. S., Dulu Appah, Michael Ogbue
Delta State University of Petroleum,
Faculty of Engineering Oleh Campus, Nigeria

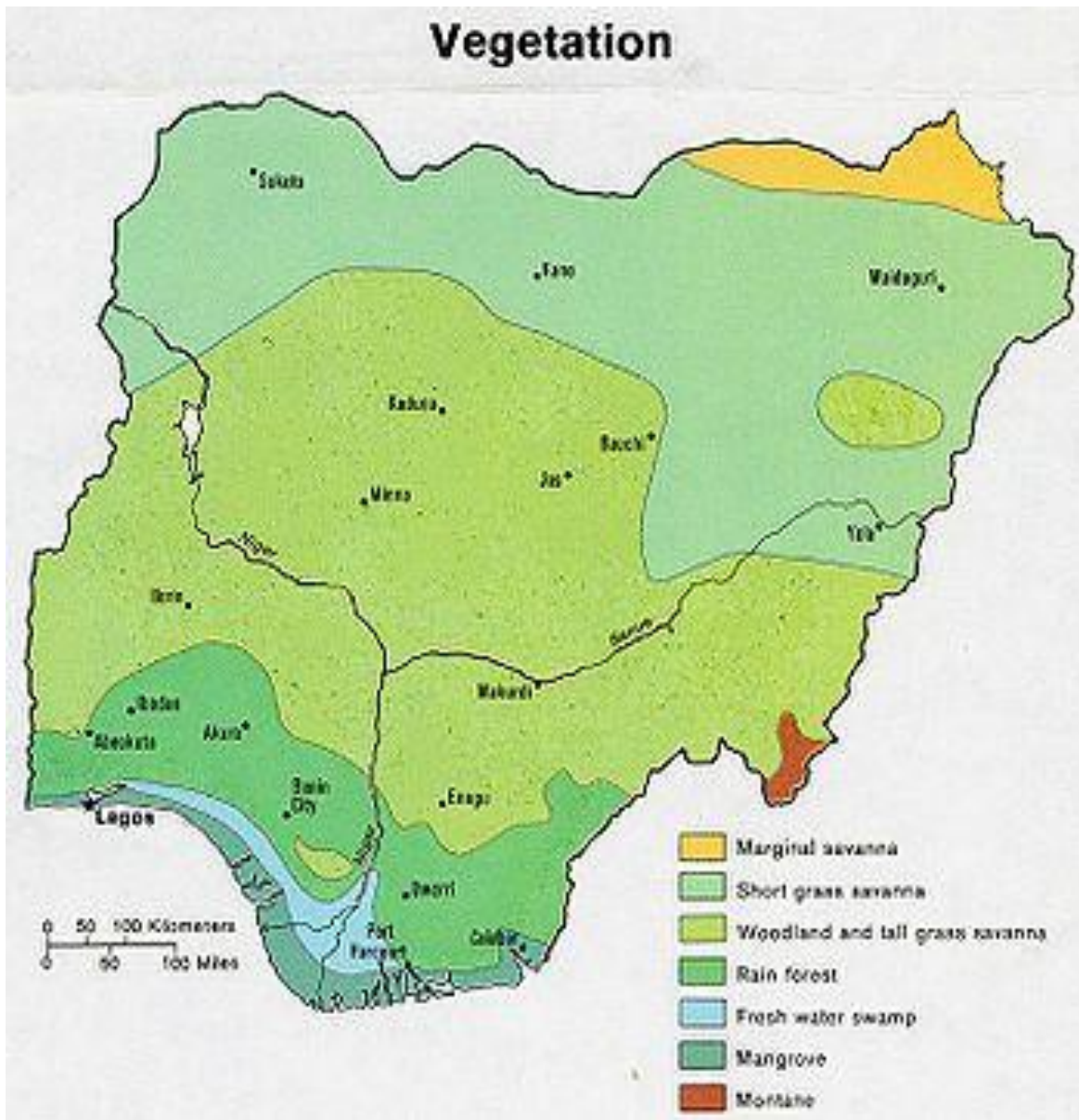
Corresponding Author Email: shadrack.akiojano@yahoo.com

ABSTRACT

Nigeria's climate has been changing in seasons and time in accordance with its tropical climatology; increases in temperature; variable rainfall; rise in sea level and flooding; drought and desertification; land degradation; more frequent extreme weather events; affected fresh water resources and loss of biodiversity. This therefore calls for serious attention to Nigerian human race as well as the world at large. There are few comprehensive literatures that provide useful evidence and discussion of the various impacts of climate change throughout Nigeria. Majority provides evidence of climate change impacts and mitigating / adaptation measures on agricultural sector and on individual farming communities in particular regions of the country which takes the form of recommendations, rather than examples of what has already been achieved. Also, some concentrates on capacity building at the individual, group and community level and not considering the Urban higher levels of capacity building at state and national levels. This paper therefore examines holistically the synergy of capacity building on both rural and the urban sector, Federal government strengthen stakeholders and partners with legal backing and sufficient resources as well as skills / knowledge, enacting and enforcing laws and frameworks to tackle climate change causes, effects and proffer mitigating measures in areas of the Health sector, Hydroelectric power supply, Income losses or economic impacts, Ecosystems, loss of shelter and road networks, Security impacts and geographical impacts.

Key Words: Climate Change, Green House Gas emission, Vulnerability, Mitigation, Adaptation, Resilience,

Temperature and weather changes



CLIMATE CHANGE

Climate change is a worldwide phenomenon that has impacted humanity negatively or positively or a combination. Literal definition of climate states that a general weather condition prevailing in an area over a period of time which means a change in such weather condition for a particular location. It can be seen as a continuous change of the earth climate caused by human behavior rather than natural changes in the atmosphere in which Nigeria is not left out.

Geographical impact:

Nigeria has a tropical climate which alternates between dry or rainy seasons. They have varying length of time depending on geographical location such as the southern part has long period of rainy season (March – November) and in the North (May – September) while dry season is prevalent

in the North with high temperature of 38 degrees Celsius and mean average temperature in the south is 32 – 33 degrees Celsius. Thus harmattan wind blows dry and hot wind longer in the Northern Nigeria than southern Nigeria. This variation of average daily weather conditions such as temperature, humidity, rainfall and sunshine of the locations over an extended period is referred to as climate change that impacts adversely on the country.

The challenge associated with climate change can lead to aridity, drought and desertification in the north; flooding and erosion in the south (Akande et.al. 2017; Nkechi et al., 2016). Vulnerability analysis demonstrates that states in the North experience higher degrees of vulnerability to climate change than those in the south (Madu, 2016; Federal Ministry of Environment, 2014). Northeast and Northwest vulnerable to the combination of heat and less rain faces desert encroachment as well as loss of wetlands and fast reduction of surface water, flora and fauna resources (Ebele and Emodi, 2016; Federal Ministry of Environment, 2014). Southwest and Southeast are relatively less vulnerable but South- South (Niger Delta region) is most vulnerable to sea level rise, Coastal erosion and flooding. This has resulted to displacement of many settlements (Matemilola, 2019; Federal Ministry of Environment, 2014).

GREEN HOUSE GASES:

Greenhouse gases mainly carbon dioxide and methane are mostly generated from oil and gas production, land – use change, forestry and agricultural emissions. Data from Potsdam Institute for climate impact research (PIK) shows that total greenhouse gas emissions in 2014 increased to 506 million tonnes of carbon dioxide in 2015. Also, GHG emission from the production and use of fossil fuel land use and forestry increased by 16 % in 2015 which is roughly equivalent to UK's total 2015 emissions as shown by the International Energy Agency (IEA). Scientists discovered that these human activities are responsible to climate change effect which is associated to Ozone layer depletion in the atmosphere that ought to prevent heat from the sun reaching the earth at high intensity. It is attributed that certain gases released from human and natural factors such as carbon monoxide, Sulphur dioxide, Chlorofluorocarbon and others are greenhouse gases that contribute to global warming when heat from the sun is trapped on the earth surface. Specifically these human activities that cause climate change are :

- Emission of GHG from Vehicles such as sulphur dioxide and carbon monoxide from their exhaust.
- Hydrocarbon products burning releases carbon dioxide and other gases into the atmosphere.
- Deforestation – Cutting down of trees that form protection barriers against sun heat.
- Industrial emissions – Petroleum, Petrochemical, Chemical industries such as fertilizer producing industries are involved in chemical processing leading to gas flaring into the atmosphere thereby contributing to climate change effect.

Health Impacts:

Climate change has serious impact on human health in Nigeria either directly or indirectly. Direct impact is from extreme weather condition events such as heat waves (BNRCC, 2011). Climate change can cause malnutrition, spread of infectious disease and water borne illness such as typhoid fever, cholera. Air pollution as agent of climate change in combination with increase in higher temperature could increase effect of meningitis (Abdukadir. Et. Al, 2017; BNRCC, 2011). NIMET also predicted incidences of malaria due to climate change and other diseases that will be higher in areas with temperatures ranging between 18 – 32 degrees Celsius and with relative humidity above 60 %. Increase in Malaria disease is a life threatening among extremes of age both young and old. Also, wildfires and dust storms occurring during dry seasons will result to environmental hazard causing respiratory illnesses.

Security impact:

Climate change could cause conflict over resources due to the less availability for eg. Desert encroachment and depleting vegetation and grazing land in the north has promoted massive migration and resettlement to less vulnerable areas. This exacerbate communal clashes among herdsmen and farmers as well as inter – ethnic clashes, resulting to loss of life (Elisha et. Al, 2017;Nkechi et. Al.,2016).

Hydroelectric Power Supply:

Kainji Dam generates significant amount of power from hydroelectric dam but with the effect of climate change resulting from unpredictable rainfall and drought tends to reduce the water level thus affecting amount of water generated which will in turn affect amount of power generated Nationwide.

Loss of Shelter and Road Networks:

Rural communities suffer more negative impact of flooding. Houses collapse due to low quality structural strength materials and road networks covered and wash away with water thereby depriving communication.

Economic Impact:

Climate change affects the country gross domestic product (GDP) due to effect on crop yields as well as fisheries thereby affecting food supply, livestock production reduction as well as loss of income.

Mitigation / Adaptation

Climate change mitigation means avoiding and reducing emissions of heat-trapping greenhouse gases into the atmosphere to prevent the planet from warming to more extreme temperatures. **Climate change adaptation** means altering our behavior, systems, and—in some cases—ways of life to protect our families, our economies, and the environment in which we live from the impacts of climate change. The more we reduce emissions right now, the easier it will be to adapt to the changes we can no longer avoid.

Mitigation actions will take decades to affect rising temperatures, so we must adapt now to the change that is already upon us—and will continue to affect us in the foreseeable future.

Vulnerability / Resilience:

Vulnerability and Risk are often used to describe the potential (adverse) effects of climate change on ecosystems, infrastructure, economic sectors, social groups, communities and regions. Project financial with the contribution to life program 2014 - 2020 (ISPRA). Vulnerability to climate change is the degree to which a system is susceptible to and unable to cope with adverse effects of climate change variability and extremes .Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, it's sensitivity and it's adaptive capacity. (IPCC)

Resilient people and livelihoods When we live in a world where people most vulnerable to climate risks, especially those living in least developed countries and small island developing States, are resilient, prosper and thrive. Actions are taken so all benefit from early warning systems; decent, secure and green jobs; resilient value chains; social protection; and getting finance to where it matters: local communities. This helps achieve climate justice and a just transition for all with no one left behind. (UNFCCC).

Resilient Businesses and Economies Where all climate risks are fully understood by all businesses, investors and society. Actions are taken to manage these risks across and within sectors, with particular focus on cities, infrastructure, services (including energy, transport and industry), agriculture and food, water and natural ecosystems, and ocean and coastal systems. This includes

delivering access to climate risk insurance for small, medium and large enterprises, and helping ensure trillions of US dollars in future investments are climate risk-informed and deliver social, environmental and economic impacts. (UNFCCC).

Resilient Environmental Systems Where nature, with its mosaic of terrestrial and marine ecosystems, is the first line of defence against climate risks of extreme events and disasters as well as long-term changes in climate. This means biodiversity and the natural ecosystems are protected to ensure the world has nutritious food, clean air, fresh water, fertile soils and pollination services. This is paramount if we are to secure resilient and sustainable development for human and planetary health and wealth and learn lessons from the COVID-19 pandemic. (UNFCCC).

CLIMATE CHANGE MITIGATION MEASURES IN NIGERIA:

Mitigation measure entails enforcing the Nigerian climate change policy and enacting laws that prohibit the release of toxic gases from industrial areas such as Chemical, Petrochemical, Petroleum and industrial processing and production companies especially in the Niger Delta region. Federal government on the other hand should synergize with stakeholders in the different ministries to ensure that policies are reviewed, revised and implemented based on relevant data and current environmental needs and challenges. There should be strict accountability and responsibility, monitoring on behalf of the legislative government to ensure laws enacted are effective and efficient as well as inspecting and auditing National environmental policy whose objective is to create an enabling environment that has low levels of air pollutants, reduced deforestation and other human activities that worsen the effects of climate change; National drought and desertification policy must be monitored and examined to meet up its obligation of vulnerability assessment by collecting and analyzing environmental data from drought and desertification prone areas. Also, urban planning should enforce building codes and National forest policy to ensure water ways are maintained and encourage flowers or trees planting to generate enough Oxygen and reduce carbon dioxide emission from Vehicles and machineries as well as ban human activities that contribute towards depletion of the ozone layer.

National erosion and flood control policy should address issues related to erosion and flooding by building levees and constructing hydroelectric dams as barriers to prevent the washing away of the nutrients in the soil and reducing the effect of erosion and flooding and improve soil quality for growing crops. Historic data of areas prone to this effect should be made available and handy for early preparation to avoid reactive action instead of proactive ensuring adequate structural and non-structural frameworks are evaluated to meet up meteorological advises.

Office of the Secretary to the government of the federation on erosion and flood control should ensure that the following objectives under its jurisdictions be performed effectively; <https://www.osgf.gov.ng> > ecological funding.

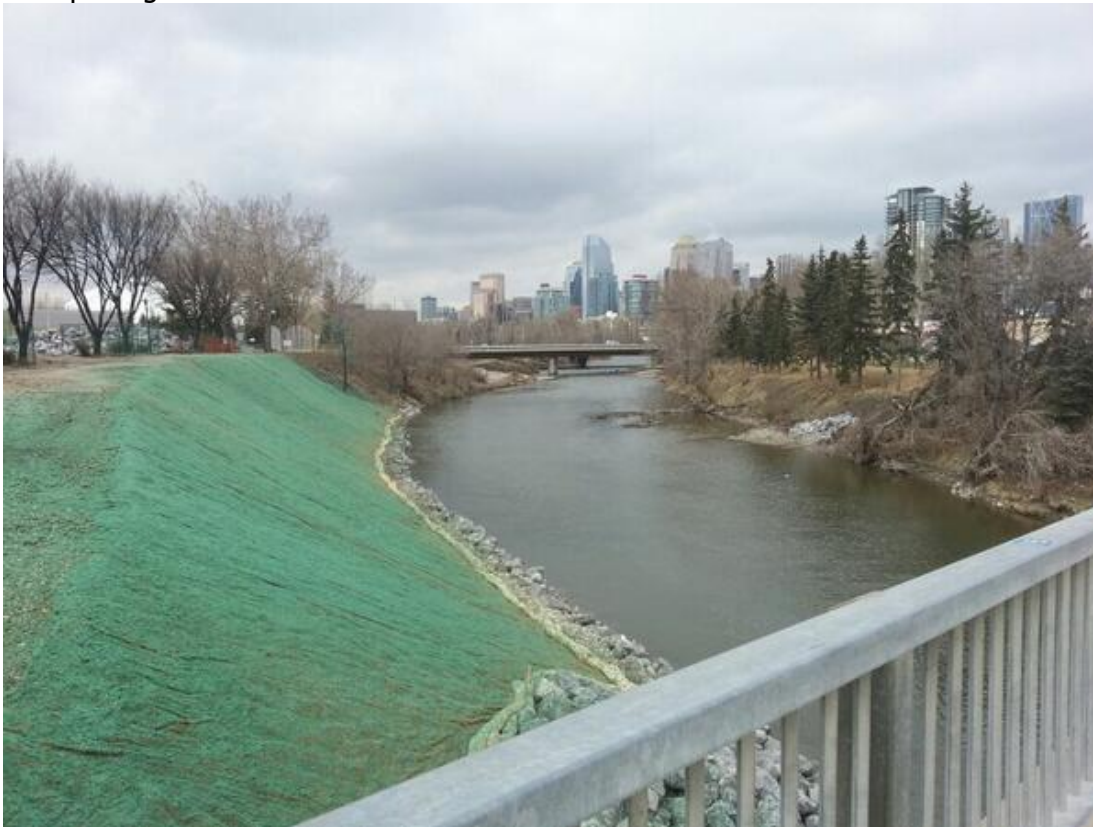
- Prepares Memoranda for Federal Executive Council (FEC)/Ecological Fund Office Tender Board (EFOTB) on award of contracts for SEFC projects;
- Liaises with all States and Federal Government Agencies on Soil and Flood Control issues;
- Fund Office Tender Board (EFOTB) on award of contracts for SEFC projects; Liaises with all States and Federal Government Agencies on Soil and Flood Control issues;
- Liaises with other departments in carrying out general functions of the office;
- Assessment and evaluation of requests relating to Soil Erosion and Flood Control for EFO Nationwide; and
- Monitoring and Evaluation of the implementation of approved Soil Erosion and Flood Control Projects Nationwide.

Erosion control is a catch-all phrase encompassing a variety of projects and methods for reducing river and stream erosion. Typically, there are three different categories of erosion control projects including; channel bank armouring, vegetative erosion control, and hard engineered structures. Channel bank armouring includes riprap projects where rocks are placed along river

banks to prevent soil erosion and gabion structures where rocks are held back using meshed wiring at different levels to mitigate flooding. Vegetative options include cement-sand bagging and planting more water-retaining vegetation along river and stream beds. Hard engineered structures refer mainly to retaining walls built from concrete that prevent soil and vegetation erosion but increase the rate of channel flow.

Erosion control is therefore the practice of re-stabilizing river and stream banks after a flood event to secure developments in the surrounding area. Erosion control measures can use hard engineering such as retaining walls to prevent future erosion, however, this prevents natural meandering of the river. More naturalized options include gabion structures, rip rap, and vegetation to soak up excess water and prevent bank destruction.

The following picture shows erosion control construction on the Elbow River at the Calgary Stampede grounds.



NIGERIA ADAPTATION MEASURES TO CLIMATE CHANGE:

Nigeria according to UNDP has to adapt to the effects of climate change both at the national and individual levels by adequate planned adaptation and adoption of adaptation strategies which includes, among others: Diversification and extension of protected areas for the conservation of ecosystems that are most vulnerable to climate change and sea level rise; Maintaining ecological structure and processes at all levels and reducing existing pressure on natural ecosystems; Reducing population and ecosystem vulnerability to climate change and reorientation of their evolution towards higher resistance to the changes; Incorporating biodiversity conservation into adaptation strategies in the other sectors of the Nigerian economy; Establishment and maintenance of protected area (in situ preservation), and the active management of wild populations outside of protected areas (ex situ management); Development and implementation of programs for restricted areas and buffer zones, resource harvesting on a sustainable basis, ecological restoration, sustainable management and agro ecosystems; and Monitoring to evaluate species and ecosystems stability from climate change perspective.

The Niger Delta is a low-lying region, cut up by a complicated system of natural channels through which the River Niger finds its way to the sea. It is made up of three distinct sub regions. They are (a) freshwater zone (b) the mangrove swamps, and (c) the zone of coastal sands and beach ridges. The freshwater zone, which starts from the apex of the delta, just below the town of Aboh, is essentially an extension of the lower Niger floodplains. The numerous water channels in this zone are bordered by natural levees, which provide the sites for most of the settlements and farmlands in the zone. The mangrove swamps, covering about 10,360 square kilometers and located to the south of the freshwater swamps, are sparsely settled. Strips of sandy beaches and ridges, which vary from a few meters to 16 kilometers, separate the mangrove swamps from the open sea. In addition to natural levees, ox-bow lakes are common landforms in the Niger Delta. The high rainfall in the region, coupled with the abundance of surface water and the flat terrain, create a serious drainage problem and makes road construction very difficult. This geographical location could only be sustained by adaptation strictly to human behavior adhering to early warnings, rules and regulations and policies.

CONCLUSION

Nigeria should keep to the mitigating and adaptive measures just as the world in general focusing on sustainability developments of the environment in which habitants enjoy a living. There should be public awareness campaigns through mass media channels to educate Nigerians on the negative impact of their activities on the environment. Teachers should teach children environmental education in schools to empower them early about the dangers of climate change and their role in mitigating it. The UNDP is committed to supporting Nigeria and a UNDP-NDC Support Program is already fully in motion. One of their goals is having increased engagement with the government and private sector. This will aid resilience to Nigeria as a country.

REFERENCES

1. O.A., Olaniyi; I.O., Olutimehin; O.A., Funmilayo (2019). "Review of Climate Change and Its effect on Nigeria Ecosystem". International Journal of Rural Development, Environment and Health Research. 3 (3): 92–100. doi:10.22161/ijreh.3.3.3.
2. Dada, Abdullahi Aliyu; Muhammad, Umar (2014-12-29). "Climate Change Education Curriculum for Nigeria Tertiary Education System". Sokoto Educational Review. 15 (2):119126. doi:10.35386/ser.v15i2.175. ISSN 2636-5367.
3. Dr. NGENE UCHE, a civil/structural engineer, wrote from Sapele Delta State.
4. Jump up to: Haider, H. "Climate Change in Nigeria: Impacts and Responses". GOV.UK. Retrieved 11 April 2021. Text was copied from this source, which is available under an Open Government Licence v3.0. © Crown copyright.
5. Akande, Adeoluwa; Costa, Ana Cristina; Mateu, Jorge; Henriques, Roberto (2017). "Geospatial Analysis of Extreme Weather Events in Nigeria (1985–2015) Using Self-Organizing Maps". Advances in Meteorology. 2017: 1–11. doi:10.1155/2017/8576150. ISSN 1687-9309.
6. Onah, Nkechi G.; Alphonsus, N. Ali; Ekenedilichukwu, Eze (2016-11-01). "Mitigating Climate Change in Nigeria: African Traditional Religious Values in Focus". Mediterranean Journal of Social Sciences. 7 (6): 299. doi:10.5901/mjss.2016.v7n6p299.
7. "Greenhouse Gas Emissions Factsheet Nigeria". Climate links. April 8, 2019. Retrieved March 31, 2021.
8. "Greenhouse Gas Emissions Factsheet: Nigeria". www.climatelinks.org. Retrieved 2021-04-21.
9. Jump up to:^{a b} Ritchie, Hannah; Roser, Max (2020-06-11). "CO₂ and Greenhouse Gas Emissions". Our World in Data.

10. Ge, Mengpin; Friedrich, Johannes; Vigna, Leandro (2020-02-06). "4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors". World Resources Institute. Retrieved 2020-11-27.
11. Jump up to:^{a b} "The Carbon Brief Profile: Nigeria". Carbon Brief. 2020-08-21. Retrieved 2021-04-21.
12. Oliver, J. G. J; Peters, J.A.H.W (May 2020). "Trends in Global Co² and total Greenhouse Gas emissions, 2019 Report". PBL Netherlands Environmental Assessment Agency – via PBL.
13. Maton, S. M.; Awari, E. S.; Labiru, M. A.; Galadima, J. S.; Binbol, N. L.; Gyang, D. L.; Parah, E. Y.; Oche, C. Y. (2020-12-02). "Perception of global warming among undergraduates of the University of Jos, Plateau State, Nigeria". *Journal of Meteorology and Climate Science*. 18 (1): 41–48. ISSN 2006-7003.
14. Asekun-Olarinmoye, Esther O.; Bamidele, James O.; Odu, Olusola O.; Olugbenga-Bello, Adenike I.; Abodurin, Olugbenga L.; Adebimpe, Wasiu O.; Oladele, Edward A.; Adeomi, Adeleye A.; Adeoye, Oluwatosin A.; Ojofeitimi, Ebenezer O. (2014). "Public perception of climate change and its impact on health and environment in rural southwestern Nigeria". *Research and Reports in Tropical Medicine*. 5: 1–10. doi:10.2147/RRTM.S53984. ISSN 1179-7282. PMC 7337145. PMID 32669887.
15. Akiojano, A.S., Dulu Appah, Ogbue Michael Understanding the source of petroleum formation from minerals Vol.2 (2025):2025: Bushwealth Academic Journals/Articles www.bwjjournal.org